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PATENT ABSTRACTS OF JAPAN

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(71)Applicant : SEIKO EPSON CORP

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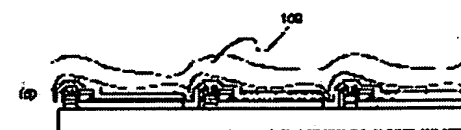
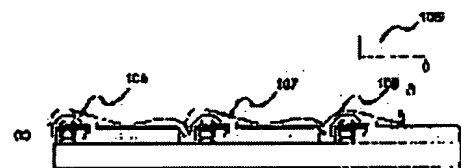
(72)Inventor : SHIMODA TATSUYA
MIYASHITA SATORU
KIGUCHI HIROSHI

(54) MANUFACTURE OF ACTIVE MATRIX TYPE ORGANIC EL DISPLAY BODY

(57)Abstract:

PROBLEM TO BE SOLVED: To manufacture an active matrix type organic EL display body at low cost by pattern-applying organic light emitting materials of red, green and blue on a base having a thin film transistor by means of ink jet.

SOLUTION: On a glass base 101, an ITO transparent picture element electrode 103 is formed after a thin film transistor 102 is formed thereon. A positive hole injection layer 104 of polyphenylene vinylene or the like is further formed thereon. This positive hole injection layer 104 is obtained by applying polytetrahydrothiophenyl phenylene of precursor followed by heating and polymerization. Organic light emitting layers 106-108 of red, green and blue are formed thereon every picture element. The organic light emitting layers are color- arranged and formed according to the pattern of each color every picture element by an ink jet printer 105. Further, A reflecting electrode 109 such as Mg, Ag or the like is formed thereon by evaporation.



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of rejection]

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decision of rejection]

[Date of extinction of right]

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JAPANESE

[JP,10-012377,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE
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CLAIMS

[Claim(s)]

[Claim 1] A hole-injection layer is formed in the transparent pixel electrode upper layer formed in the glass substrate which has TFT. In the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color besides chosen as the layer from red, green, and blue for every pixel at least is formed, and a reflector is further formed in this upper layer The manufacture method of the active matrix type organic EL display object characterized by making formation and the array of the aforementioned organic luminous layer by the ink-jet method.

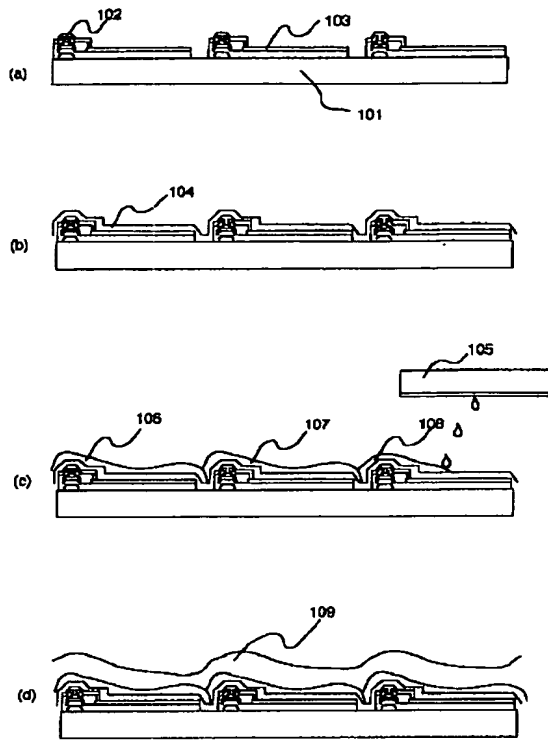
[Claim 2] The manufacture method of the active matrix type organic EL display object characterized by to make formation and the array of the aforementioned organic luminous layer by the ink-jet method in the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color chosen from red, green, and blue as the transparent pixel electrode upper layer formed in the glass substrate which has TFT for every pixel at least is formed, and a reflector is further formed in this upper layer.

[Claim 3] In the reflective pixel electrode upper layer formed in the glass substrate which has TFT, for every pixel at least Red, In the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color chosen from green and blue is formed, a hole-injection layer is formed in this upper layer, and a transparent electrode is further formed in this upper layer The manufacture method of the active matrix type organic EL display object characterized by making formation and the array of the aforementioned organic luminous layer by the ink-jet method.

[Claim 4] The manufacture method of the active matrix type organic EL display object characterized by to be made formation and the array of the aforementioned organic luminous layer by the ink-jet method in the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color chosen from red, green, and blue as the reflective pixel electrode upper layer formed in the glass substrate which has TFT for every pixel at least is formed, and a transparent electrode is further formed in this upper layer.

[Translation done.]

Drawing selection [Representative drawing] 



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the manufacture method using the ink-jet method of active matrix type EL display object which used TFT.

[0002]

[Description of the Prior Art] An organic EL element is an element made to emit light using discharge (fluorescence and phosphorescence) of the light at the time of having the composition which sandwiched the thin film containing a fluorescence nature organic compound by cathode and the anode plate, making an exciton (exciton) generate by making an electron and an electron hole (hole) pour in and recombine with the aforementioned thin film, and this exciton deactivating.

[0003] The feature of this organic EL element is 100 – 100000 cd/m² at the low battery not more than 10V. It is that field luminescence of high brightness of a grade is possible, and luminescence to blue shell red is possible by choosing the kind of fluorescent substance.

[0004] The organic EL element attracts attention as what realizes a cheap large area full color display device (an electronic-intelligence communication society technical report, the 89th volume, NO.106, 49 pages, 1989). According to the report, the organic coloring matter which emits strong fluorescence was used for the luminous layer, and bright luminescence of blue, green, and red has been obtained. this having emitted strong fluorescence by the shape of a thin film, and having used the organic coloring matter with few pinhole defects -- it is -- high -- it is thought that the brightness full color display was realizable

[0005] furthermore, the thin film layer to which the component of an organic luminous layer becomes JP,5-78655,A from the mixture of an organic charge material and an organic luminescent material -- preparing -- concentration quenching -- preventing -- the selection width of face of luminescent material -- extending -- high -- the purport used as a brightness full color element is proposed

[0006] However, reference is made by neither of the reports about the composition and the manufacture method of an actual full color display panel.

[0007]

[Problem(s) to be Solved by the Invention] The organic thin film EL element using the above-mentioned organic coloring matter shows luminescence of blue, green, and red. However, in order to realize a full color display object as known well, it is necessary to arrange the organic luminous layer which emits light in the three primary colors for every pixel.

Conventionally, technology which carries out patterning of the organic luminous layer was made very difficult. A cause is the point that the surface of metal of one of reflector material is unstable, and the patterning precision of vacuum evaporation does not come out. The 2nd is the point that polymer or the precursor which form a hole-injection layer and an organic luminous layer do not have resistance to patterning processes, such as photo lithography.

[0008] this invention solves a technical problem which was mentioned above, and the purpose is in offering the manufacture method of the active matrix type EL display object which carried out patterning of the organic luminous layer for every pixel with the ink-jet method.

[0009]

[Means for Solving the Problem] The manufacture method of the active matrix type organic EL display object in connection with this invention A hole-injection layer is formed in the transparent pixel electrode upper layer formed in the glass substrate which has TFT. In the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color besides chosen as the layer from red, green, and blue for every pixel at least is formed, and a reflector is further formed in this upper layer It is characterized by making formation and the array of the aforementioned organic luminous layer by the ink-jet method. In the transparent pixel electrode upper layer formed in the glass substrate which has TFT, for every pixel at least Moreover, red, In the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color chosen from green and blue is formed, and a reflector is further formed in this upper layer, it is characterized by making formation and the array of the aforementioned organic luminous layer by the ink-jet method.

[0010] In the reflective pixel electrode upper layer formed in the glass substrate which has TFT, for every pixel at least Furthermore, red, In the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color chosen from green and blue is formed, a hole-injection layer is formed in this upper layer, and a transparent electrode is further formed in this upper layer It is characterized by making formation and the array of the aforementioned organic luminous layer by the ink-jet method. In the reflective pixel electrode upper layer formed in the glass substrate which has TFT, for every pixel at least Moreover, red, In the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color chosen from green and blue is formed, and a transparent electrode is further formed in this upper layer, it is characterized by making formation and the array of the aforementioned organic luminous layer by the ink-jet method.

[0011] As shown in drawing 3 in short, on the signal line 301 formed on the substrate, the gate line 302, the pixel electrode 303, and TFT 304, by the ink-jet method, this invention is carrying out the patterning application of red and the organic green and blue luminescent material, and realizes a full color display.

[0012]

[Embodiments of the Invention] Hereafter, the suitable operation gestalt of this invention is explained with reference to a drawing.

[0013] (Example 1) As shown in drawing 1 , after forming TFT 102 on a glass substrate 101, the ITO transparent pixel electrode 103 is formed.

[0014] The polytetrahydro thiophenyl phenylene which is a polymer precursor as a hole-injection material is coated. Of heating, a precursor serves as a polyphenylene vinylene and the hole-injection layer 104 with a thickness of 0.05 microns is formed.

[0015] Next, the patterning application of the luminescent material which colors red, green, and blue with ink-jet print equipment 105 is carried out, and the coloring layers 106, 107, and 108 with a thickness of 0.05 microns are formed. A polyphenylene vinylene is used for a cyano polyphenylene vinylene and green luminescent material, and a polyphenylene vinylene and the poly alkyl phenylene are used for blue luminescent material at red luminescent material. It is the Cambridge Display Technologies make, and such organic EL material is liquefied and available.

[0016] Finally, the MgAg reflector 109 with a thickness of 0.1-0.2 microns is formed by the vacuum deposition.

[0017] Thereby, the full color organic EL display object of a direct viewing type is completed.

[0018] (Example 2) As shown in drawing 2 , after forming TFT 202 on a glass substrate 201, the

AlLi reflective pixel electrode 203 is formed.

[0019] Next, the patterning application of the luminescent material which colors red, green, and blue with ink-jet print equipment 207 is carried out, and the coloring layers 204, 205, and 206 are formed. A polyphenylene vinylene is used for a cyano polyphenylene vinylene and green luminescent material, and a polyphenylene vinylene and the poly alkyl phenylene are used for blue luminescent material at red luminescent material. It is the Cambridge Display Technologies make, and such organic EL material is liquefied and available.

[0020] The polytetrahydro thiophenyl phenylene which is a polymer precursor as a hole-injection material is formed by the cast method. Of heating, a precursor serves as a polyphenylene vinylene and the hole-injection layer 208 is formed.

[0021] Finally, the ITO transparent electrode 209 is formed by the vacuum deposition.

[0022] Thereby, a reflected type full color organic EL display object is completed.

[0023] (Example 3) as an organic luminescent material of an organic luminous layer -- 2, 3, 6, 7-tetrahydro-11-oxo-1H, and 5H and 11H -- it considers as a green luminescent material by mixing both using a -(1) benzo PIRANO [6, 7, 8-ij]-kino lysine-10-carboxylic acid, using a 1 and 1-screw-(4-N and N-ditolylamino phenyl) cyclohexane as an organic hole-injection layer material

[0024] Similarly, they are 2-13' and a 4'-dihydroxy phenyl as an organic red luminescent material. - It mixes with hole-injection layer material using 3, 5, and 7-trihydroxy-1-benzo pyrylium perchlorate.

[0025] Furthermore, tris (8-hydroxy quinolinol) aluminum is used for a blue luminous layer as an organic hole-injection material, and it is 2, 3, 6, and 7-tetrahydro-9-methyl-11-oxo as an organic luminescent material. -A 1H, 5H, and 11H-(1) benzo PIRANO [6, 7, 8-ij]-kino lysine is mixed, and luminescent material is created.

[0026] At the same process as an example 1 or an example 2, partial patterning of each luminous layer is carried out with ink jet printer equipment, and an active matrix type organic EL display object is created.

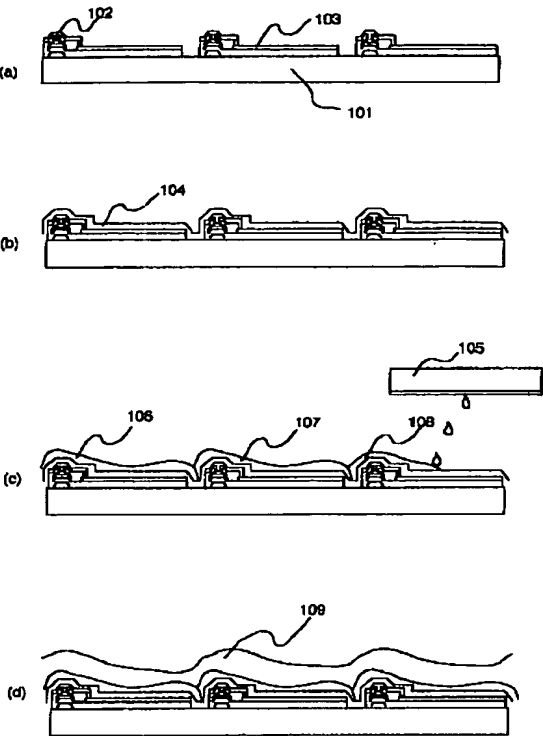
[0027] Besides organic EL material used by this example, in addition, an aroma tick diamine derivative (TDP), An oxy-diazole dimer (OXD), an oxy-diazole derivative (PBD), A JISUCHIRU arylene derivative (DSA), a quinolinol system metal complex, a beryllium-benzo quinolinol complex (Bebq), A triphenylamine derivative (MTDATA), a JISUCHIRIRU derivative, a pyrazoline dimer, Although rubrene, a Quinacridone, a triazole derivative, a polyphenylene, the poly alkyl fluorene, the poly alkyl thiophene, an azomethine zinc complex, a porphyrin zinc complex, a benzo oxazole zinc complex, and a phenanthroline europium complex can be used It is not the object restricted to this.

[0028]

[Effect of the Invention] Patterning became possible in forming and arranging organic EL material it was presupposed that patterning was impossible of material conventionally with an ink-jet method, and the active matrix type organic EL display object of a full color display was realized. Manufacture of the full color display object of a big screen is attained [that it is cheap and] by this, and an effect is size.

[Translation done.]

Drawing selection [Representative drawing]



[Translation done.]

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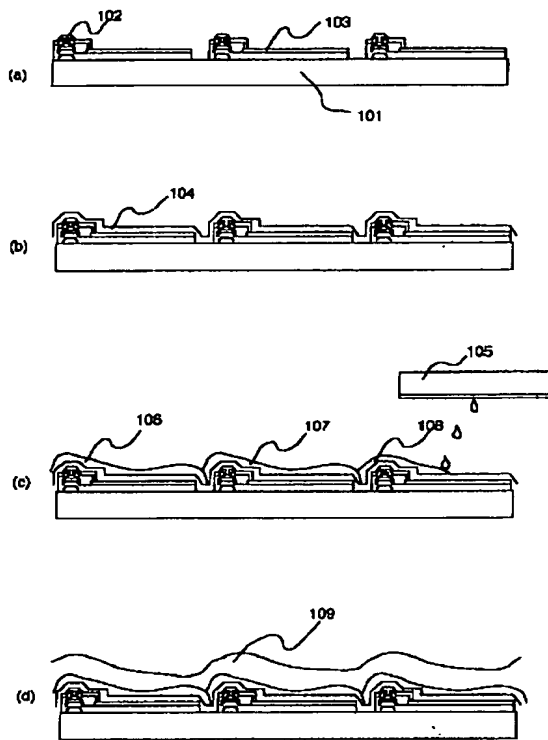
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PRIOR ART

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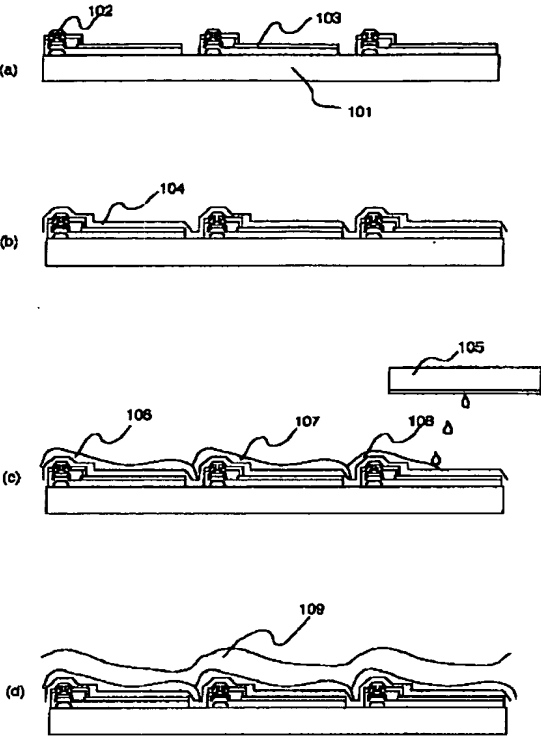
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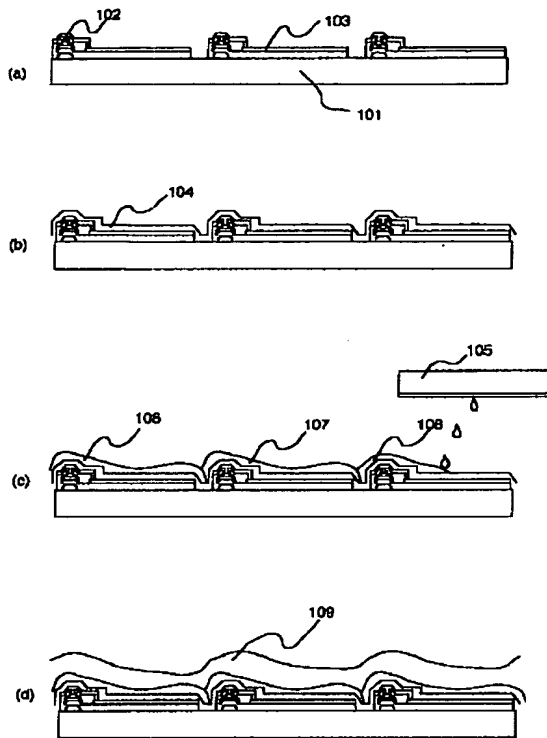
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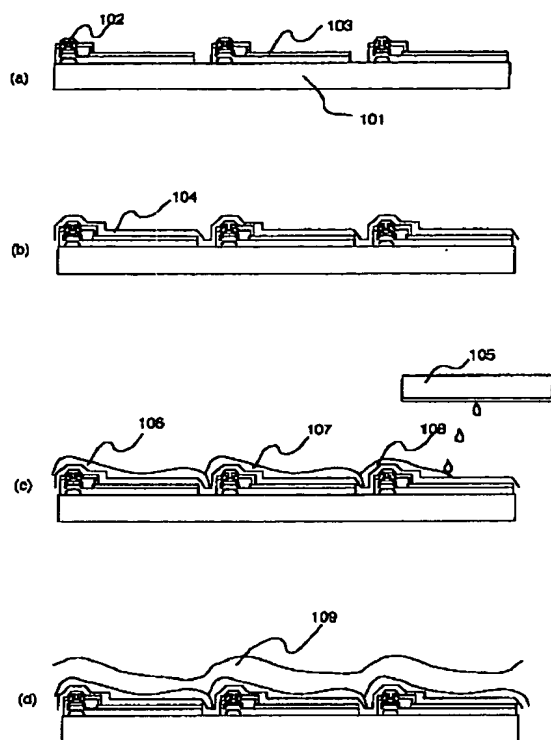
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MEANS

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[0013] (Example 1) As shown in drawing 1 , after forming TFT 102 on a glass substrate 101, the ITO transparent pixel electrode 103 is formed.

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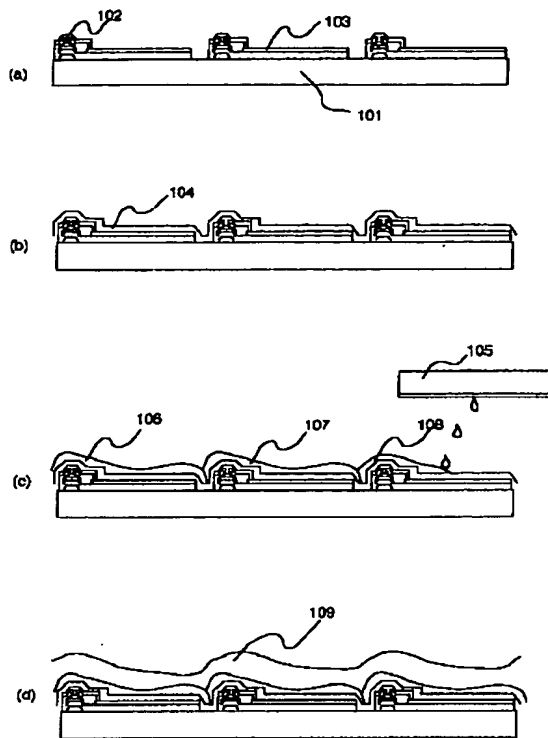
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[0027] Besides organic EL material used by this example, in addition, an aroma tick diamine derivative (TDP), An oxy-diazole dimer (OXD), an oxy-diazole derivative (PBD), A JISUCHIRU arylene derivative (DSA), a quinolinol system metal complex, a beryllium-benzo quinolinol complex (Bebq), A triphenylamine derivative (MTDATA), a JISUCHIRIRU derivative, a pyrazoline dimer, Although rubrene, a Quinacridone, a triazole derivative, a polyphenylene, the poly alkyl fluorene, the poly alkyl thiophene, an azomethine zinc complex, a porphyrin zinc complex, a benzo oxazole zinc complex, and a phenanthroline europium complex can be used It is not the object restricted to this.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is drawing showing the process of the active matrix type organic EL display object in the 1st operation gestalt of this invention.

[Drawing 2] It is drawing showing the process of the active matrix type organic EL display object in the 2nd operation gestalt of this invention.

[Drawing 3] It is drawing showing the coloring layer formed by the ink-jet method on the TFT of this invention.

[Description of Notations]

101 Glass Substrate

102 TFT

103 Transparent Pixel Electrode

104 Hole-Injection Layer

105 Ink Jet Printer Head

106 Organic Luminous Layer (1st Color)

107 Organic Luminous Layer (2nd Color)

108 Organic Luminous Layer (3rd Color)

109 Reflector

201 Glass Substrate

202 TFT

203 Reflective Pixel Electrode

204 Organic Luminous Layer (1st Color)

205 Organic Luminous Layer (2nd Color)

206 Organic Luminous Layer (3rd Color)

207 Ink Jet Printer Head

208 Hole-Injection Layer

209 Transparent Electrode

301 Signal Line

302 Gate Line

303 Pixel Electrode


304 TFT

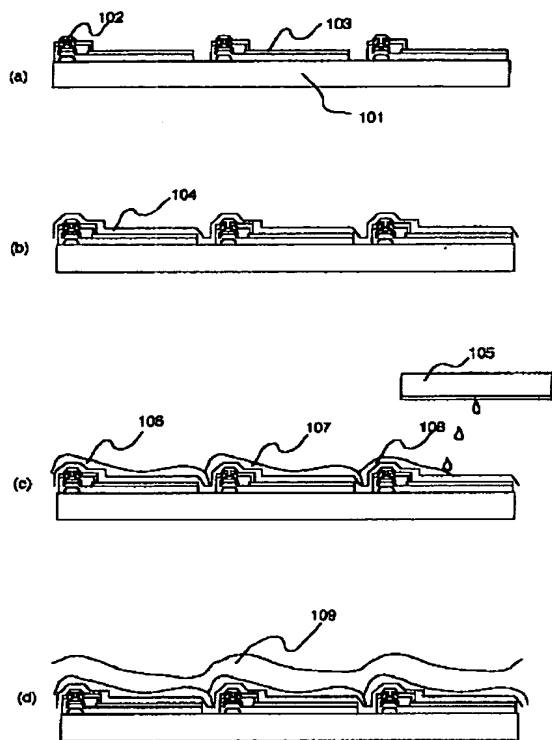
305 Organic Luminous Layer (1st Color)

306 Organic Luminous Layer (2nd Color)

307 Organic Luminous Layer (3rd Color)

[Translation done.]

Drawing selection [R presentativ drawing] 



[Translation done.]

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JAPANESE

[JP,10-012377,A]

CLAIMS DETAILED DESCRIPTION TECHNICAL FIELD PRIOR ART EFFECT OF THE
INVENTION TECHNICAL PROBLEM MEANS DESCRIPTION OF DRAWINGS DRAWINGS
CORRECTION or AMENDMENT

[Translation done.]

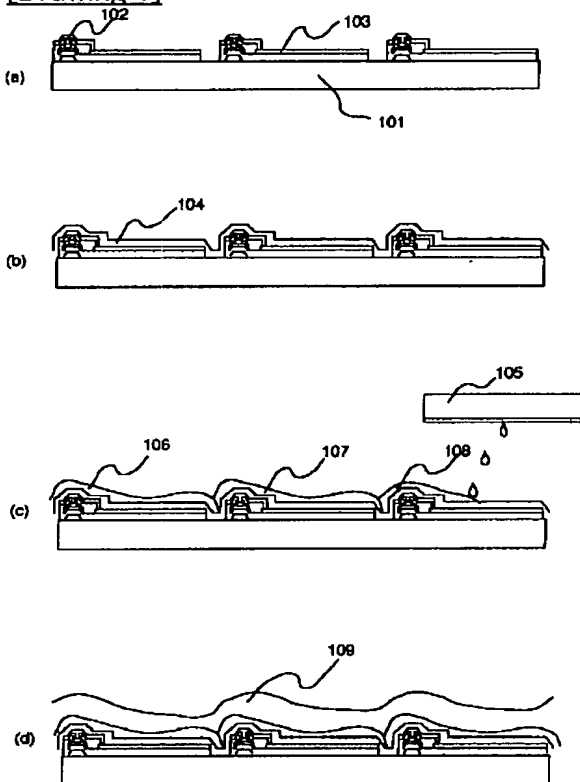
*** NOTICES ***

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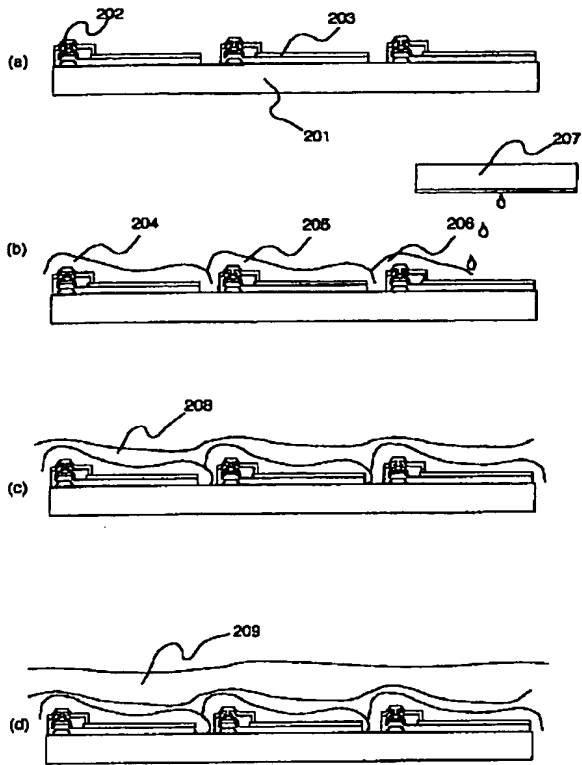
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- 2.**** shows the word which can not be translated.
- 3.In the drawings, any words are not translated.

DRAWINGS

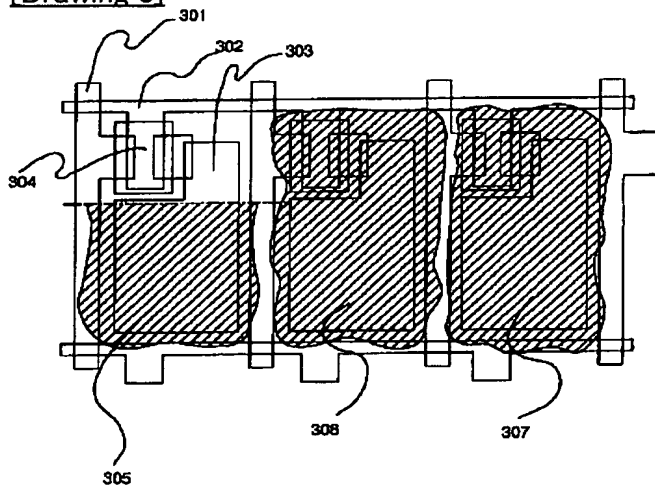
[Drawing 1]



[Drawing 2]

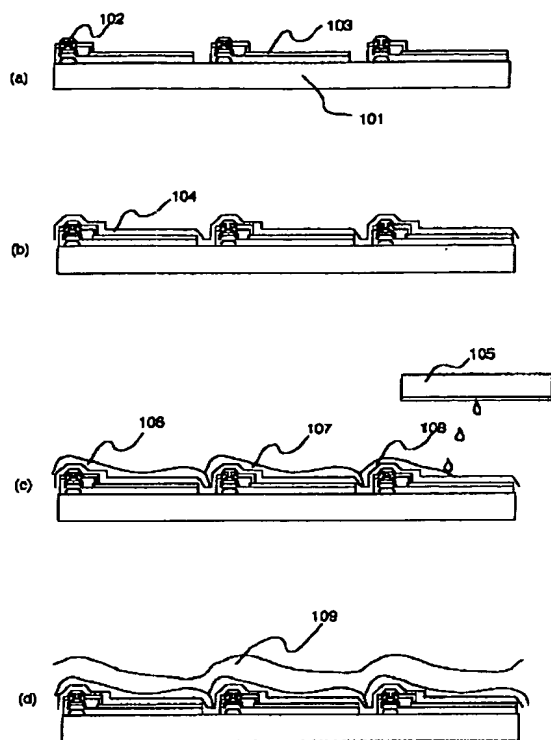


[Drawing 3]



[Translation done.]

Drawing selection [Representativ drawing] 



[Translation done.]

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[Back to original](#) [JP,10-012377,A]

[Translation done.]

1. Amendment March 16, Heisei 13 (2001)

[Translation done.]

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CORRECTION or AMENDMENT

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H05B 33/10

B41J 2/01

[FI]

H05B 33/10

B41J 3/04 101 Z

[Procedure revision]

[Filing Date] October 29, Heisei 11 (1999. 10.29)

[Procedure amendment 1]

[Document to be Amended] Specification

[Item(s) to be Amended] Claim

[Method of Amendment] Change

[Proposed Amendment]

[Claim(s)]

[Claim 1] A hole-injection layer is formed in the transparent pixel electrode upper layer formed in the glass substrate which has TFT. In the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color besides chosen as the layer from red, green, and blue for every pixel at least is formed, and a reflector is further formed in this upper layer The manufacture method of the active matrix type organic EL display object characterized by making formation and the array of the aforementioned organic luminous layer by the ink-jet method.

[Claim 2] The manufacture method of the active matrix type organic EL display object characterized by to make formation and the array of the aforementioned organic luminous layer by the ink-jet method in the manufacture method of an active matrix type organic EL display

object that the organic luminous layer which has the luminescent color chosen from red, green, and blue as the transparent pixel electrode upper layer formed in the glass substrate which has TFT for every pixel at least is formed, and a reflector is further formed in this upper layer.

[Claim 3] In the reflective pixel electrode upper layer formed in the glass substrate which has TFT, for every pixel at least Red, In the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color chosen from green and blue is formed, a hole-injection layer is formed in this upper layer, and a transparent electrode is further formed in this upper layer The manufacture method of the active matrix type organic EL display object characterized by making formation and the array of the aforementioned organic luminous layer by the ink-jet method.

[Claim 4] The manufacture method of the active matrix type organic EL display object characterized by to be made formation and the array of the aforementioned organic luminous layer by the ink-jet method in the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color chosen from red, green, and blue as the reflective pixel electrode upper layer formed in the glass substrate which has TFT for every pixel at least is formed, and a transparent electrode is further formed in this upper layer.

[Claim 5] The manufacture method of the active matrix type organic EL display object according to claim 1 to 4 which supplies polymer or its precursor by the aforementioned ink-jet method, and forms the aforementioned organic luminous layer.

[Claim 6] The manufacture method of the active matrix type organic EL display object according to claim 1 to 5 which forms the aforementioned organic luminous layer which has the red luminescent color by the cyano polyphenylene vinylene.

[Claim 7] The manufacture method of the active matrix type organic EL display object according to claim 1 to 6 which forms the aforementioned organic luminous layer which has the green luminescent color by the polyphenylene vinylene.

[Claim 8] The manufacture method of the active matrix type organic EL display object according to claim 1 to 7 which forms the aforementioned organic luminous layer which has the blue luminescent color by the polyphenylene vinylene and the poly alkyl phenylene.

[Claim 9] The manufacture method of the active matrix type organic EL display object according to claim 1 to 8 which constitutes the aforementioned organic luminous layer from a poly alkyl fluorene.

[Procedure amendment 2]

[Document to be Amended] Specification

[Item(s) to be Amended] 0009

[Method of Amendment] Change

[Proposed Amendment]

[0009]

[Means for Solving the Problem] The manufacture method of the active matrix type organic EL display object in connection with this invention A hole-injection layer is formed in the transparent pixel electrode upper layer formed in the glass substrate which has TFT. The organic luminous layer (organic luminous layer which consisted of luminescent material which consists especially of polymer or its precursor) which has the luminescent color besides chosen as the layer from red, green, and blue for every pixel at least is formed. Furthermore, in the manufacture method of an active matrix type organic EL display object that a reflector is formed in this upper layer, it is characterized by making formation and the array of the aforementioned organic luminous layer by the ink-jet method. Moreover, in the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color chosen from red, green, and blue as the transparent pixel electrode upper layer formed in the glass substrate which has TFT for every pixel at least is formed, and a reflector is further formed in this upper layer, it is characterized by making formation and the

array of the aforementioned organic luminous layer by the ink-jet method.

----- [Procedur revision]

[Filing Date] November 25, Heisei 11 (1999. 11.25)

[Procedure amendment 1]

[Document to be Amended] Specification

[Item(s) to be Amended] Claim

[Method of Amendment] Change

[Proposed Amendment]

[Claim(s)]

[Claim 1] A hole-injection layer is formed in the transparent pixel electrode upper layer formed in the glass substrate which has TFT. In the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color besides chosen as the layer from red, green, and blue for every pixel at least is formed, and a reflector is further formed in this upper layer The manufacture method of the active matrix type organic EL display object characterized by forming the aforementioned organic luminous layer with an ink-jet method so that the configuration and array may serve as the last pattern.

[Claim 2] In the transparent pixel electrode upper layer formed in the glass substrate which has TFT, for every pixel at least Red, In the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color chosen from green and blue is formed, and a reflector is further formed in this upper layer The manufacture method of the active matrix type organic EL display object characterized by forming the aforementioned organic luminous layer with an ink-jet method so that the configuration and array may serve as the last pattern.

[Claim 3] In the reflective pixel electrode upper layer formed in the glass substrate which has TFT, for every pixel at least Red, In the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color chosen from green and blue is formed, a hole-injection layer is formed in this upper layer, and a transparent electrode is further formed in this upper layer The manufacture method of the active matrix type organic EL display object characterized by forming the aforementioned organic luminous layer with an ink-jet method so that the configuration and array may serve as the last pattern.

[Claim 4] In the reflective pixel electrode upper layer formed in the glass substrate which has TFT, for every pixel at least Red, In the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color chosen from green and blue is formed, and a transparent electrode is further formed in this upper layer The manufacture method of the active matrix type organic EL display object characterized by forming the aforementioned organic luminous layer with an ink-jet method so that the configuration and array may serve as the last pattern.

[Claim 5] The manufacture method of the active matrix type organic EL display object according to claim 1 to 4 which supplies polymer or its precursor by the aforementioned ink-jet method, and forms the aforementioned organic luminous layer.

[Claim 6] The manufacture method of the active matrix type organic EL display object according to claim 1 to 5 which forms the aforementioned organic luminous layer which has the red luminescent color by the cyano polyphenylene vinylene.

[Claim 7] The manufacture method of the active matrix type organic EL display object according to claim 1 to 6 which forms the aforementioned organic luminous layer which has the green luminescent color by the polyphenylene vinylene.

[Claim 8] The manufacture method of the active matrix type organic EL display object according to claim 1 to 7 which forms the aforementioned organic luminous layer which has the blue luminescent color by the polyphenylene vinylene and the poly alkyl phenylene.

[Claim 9] The manufacture method of the active matrix type organic EL display object according

to claim 1 to 8 which constitutes the aforementioned organic luminous layer from a poly alkyl fluorene.

[Procedure amendment 2]

[Document to be Amended] Specification

[Item(s) to be Amended] 0009

[Method of Amendment] Change

[Proposed Amendment]

[0009]

[Means for Solving the Problem] The manufacture method of the active matrix type organic EL display object in connection with this invention A hole-injection layer is formed in the transparent pixel electrode upper layer formed in the glass substrate which has TFT. The organic luminous layer (organic luminous layer which consisted of luminescent material which consists especially of polymer or its precursor) which has the luminescent color besides chosen as the layer from red, green, and blue for every pixel at least is formed. Furthermore, in the manufacture method of an active matrix type organic EL display object that a reflector is formed in this upper layer, it is characterized by forming the aforementioned organic luminous layer with an ink-jet method so that the configuration and array may serve as the last pattern. Moreover, in the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color chosen from red, green, and blue as the transparent pixel electrode upper layer formed in the glass substrate which has TFT for every pixel at least is formed, and a reflector is further formed in this upper layer, it is characterized by forming the aforementioned organic luminous layer with an ink-jet method so that the configuration and array may serve as the last pattern.

[Procedure amendment 3]

[Document to be Amended] Specification

[Item(s) to be Amended] 0010

[Method of Amendment] Change

[Proposed Amendment]

[0010] In the reflective pixel electrode upper layer formed in the glass substrate which has TFT, for every pixel at least Furthermore, red, In the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color chosen from green and blue is formed, a hole-injection layer is formed in this upper layer, and a transparent electrode is further formed in this upper layer It is characterized by forming the aforementioned organic luminous layer with an ink-jet method so that the configuration and array may serve as the last pattern. In the reflective pixel electrode upper layer formed in the glass substrate which has TFT, for every pixel at least Moreover, red, In the manufacture method of an active matrix type organic EL display object that the organic luminous layer which has the luminescent color chosen from green and blue is formed, and a transparent electrode is further formed in this upper layer It is characterized by forming the aforementioned organic luminous layer with an ink-jet method so that the configuration and array may serve as the last pattern.

[Translation done.]

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(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開平10-12377

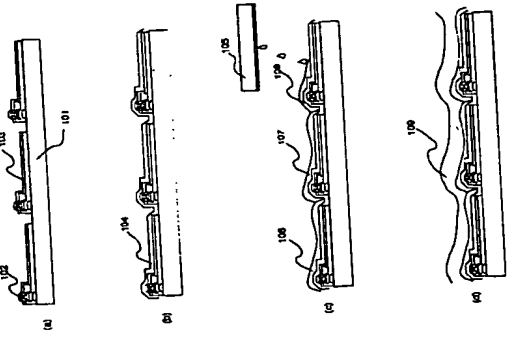
(19) 日本国特許庁 (J P)

(43) 公開日 平成10年(1998) 1月16日

特許請求の範囲		技術的効果	
(51) Int. Cl.	分類記号	特許請求の範囲	技術的効果
H05B 33/10 B41J 2/01	F I H05B 33/10 B41J 2/01	1012	
審査請求 未請求 請求項の数 4 O L (全 5 頁)			
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(54) 発明の名称 アクティブマトリックス型有機EL表示体の製造方法

(57) 要約
【解決手段】 従来の、バタニングができないとされた有機EL材料をインクジェット方式により形成および配列すること、赤、緑、青の発光色を備える有機発光層を画素毎に任意にバタニングすることが可能となった。これにより、フルカラー表示のアクティブマトリックス型有機EL表示体を実現した。
【効果】 安価で大面積のフルカラー表示体が製造可能となり、効果は大きい。



(2) 特許請求の範囲

- 【請求項1】 薄膜トランジスタを有するガラス基板に形成された透明画素電極上に正孔注入層が形成され、この上に少なくとも各画素毎に赤、緑、青より選択された発光色を有する有機発光層が形成され、更にこの上に反射電極が形成されるアクティブマトリックス型有機EL表示体の製造方法において、前記有機発光層の形成および配列がインクジェット方式によりなされることを特徴とするアクティブマトリックス型有機EL表示体の製造方法。
- 【請求項2】 薄膜トランジスタを有するガラス基板に形成された透明画素電極上に少なくとも各画素毎に赤、緑、青より選択された発光色を有する有機発光層が形成され、更にこの上に反射電極が形成されるアクティブマトリックス型有機EL表示体の製造方法において、前記有機発光層の形成および配列がインクジェット方式によりなされることを特徴とするアクティブマトリックス型有機EL表示体の製造方法。
- 【請求項3】 薄膜トランジスタを有するガラス基板に形成された反射画素電極上に少なくとも各画素毎に赤、緑、青より選択された発光色を有する有機発光層が形成され、この上に正孔注入層が形成され、更にこの上に透明電極が形成されるアクティブマトリックス型有機EL表示体の製造方法において、前記有機発光層の形成および配列がインクジェット方式によりなされることを特徴とするアクティブマトリックス型有機EL表示体の製造方法。
- 【請求項4】 薄膜トランジスタを有するガラス基板に形成された反射画素電極上に少なくとも各画素毎に赤、緑、青より選択された発光色を有する有機発光層が形成され、更にこの上に透明電極が形成されるアクティブマトリックス型有機EL表示体の製造方法において、前記有機発光層の形成および配列がインクジェット方式によりなされることを特徴とするアクティブマトリックス型有機EL表示体の製造方法。
- 【発明の詳細な説明】
- 【0001】 本発明は、薄膜トランジスタを用いたアクティブマトリックス型のEL表示体のインクジェット方式を用いた製造方法に関する。
- 【0002】 従来の技術 有機EL素子は、蛍光性有機化合物を含む有機層、陰極と陽極とで挟んだ構成を有し、前記有機層に電子および正孔（ホール）を注入して再結合させることにより励起子（エキシトン）を生成させ、このエキシトンが失活する際の光の放出（蛍光・燐光）を利用して発光させる素子である。
- 【0003】 この有機EL素子の特性は、10V以下の低電圧で100~100000 cd/m² 程度の高輝度の面発光が可能であり、また蛍光物質の種類を選択することにより青色から赤色までの発光が可能であることである。
- 【0004】 有機EL素子は、安価で大面積フルカラー表示素子を実現するものとして注目を集めている（電子情報通信学会技術報告、第89号、NO. 106、49ページ、1989年）。報告によると、強い蛍光を有する有機発光層に使用し、青、緑、赤色の明るい発光を得ている。これは、薄膜状で強い蛍光を有し、ピンホール欠陥の少ない有機発光層を用いたことで、高輝度なフルカラー表示を実現できたと考えられている。
- 【0005】 更に特開平5-78655号公報には、有機発光層の成分が有機発光材料と有機発光材料の混合物からなる薄膜層を設け、強度を防止して発光材料の選択層を広げ、高輝度なフルカラー素子とする旨が提案されている。
- 【0006】 しかし、いずれの報告にも、実際のフルカラー表示パネルの構成や製造方法については言及されていない。
- 【0007】 本発明が解決しようとする課題 前述の有機発光層を用いた有機発光素子は、青、緑、赤の発光を示す。しかし、よく知られているように、フルカラー表示体を実現するためには、3原色を発光する有機発光層を画素毎に配置する必要がある。従来、有機発光層をバタニングする技術は非常に困難とされていた。原因は、一つは反射電極材の金属表面が不安定であり、2つめは、正孔注入層の精度が出ないという点である。つまり、正孔注入層および有機発光層を形成するポリマーや前駆体に対して耐性が無いという点である。
- 【0008】 本発明は、上述したような課題を解決するものであり、その目的は、有機発光層をインクジェット方式により画素毎にバタニングしたアクティブマトリックス型有機EL表示体の製造方法を提案することにある。
- 【0009】 本発明が解決するための手段 本発明に係るアクティブマトリックス型有機EL表示体の製造方法は、薄膜トランジスタを有するガラス基板に形成された透明画素電極上に正孔注入層が形成され、この上に少なくとも各画素毎に赤、緑、青より選択された発光色を有する有機発光層が形成され、更にこの上に反射電極が形成されるアクティブマトリックス型有機EL表示体の製造方法において、前記有機発光層の形成および配列がインクジェット方式によりなされることを特徴とし、また、薄膜トランジスタを有するガラス基板に形成された透明画素電極上に少なくとも各画素毎に赤、緑、青より選択された発光色を有する有機発光層が形成され、更にこの上に反射電極が形成されるアクティブマトリックス型有機EL表示体の製造方法において、前記有機発光層の形成および配列がインクジェット方式によりなされることを特徴とする。

(d)

【0010】更に、両極トランジスタを有するガラス基板上に形成された互向画電極層の上面に少なくとも各画電極層に赤、緑、青より選択された発光色を有する有機発光層が形成され、この上面に互孔状を入層が形成され、更にこの上面に透明電極が形成されるアクティブマトリックス型有機EL表示体の製造方法において、前記有機発光層の形成および配向インクジェット方式によりなされるガラス基板と形成され、また、両極トランジスタを有するガラス基板と形成され、更にこの上面に透明電極が形成される有機EL表示体の製造方法において、前記有機発光層の形成および配向インクジェット方式によりなされることを特徴とする。

【0011】本発明は、要するに図3に示すように、基板の上に形成された信号線301、ダート線302、画素電極303および薄膜トランジスタ304上に、インクジェット法により、赤、緑、青色の有機発光材料をバタニング散布することで、フルカラー表示を実現するものである。

【0012】
【発明の実施の形態】以下、本発明の好適な実施形態に
ついて図面を参照して説明する。

【0013】(実施例1) 図1に示すように、ガラス基板101上に珪酸トランジスタ102を形成してから、ITO透明電極103を形成する。

【0014】正孔注入材料としてポリマー前駆体であるポリテトラヒドロチオフェンフルフェニレンをコーディングする。加熱により、前駆体はポリフェニレンビニレンとなり、厚さ0.05ミクロンの正孔注入層104が形成される。

【0015】次に、インクジェットプリンタ装置105により赤、青、黄色の各色の染料材料をパターンニング塗布し、厚さ0.3ミクロンの厚さ10、10、7、108を形成する。黄色染料材料にはシアノレネビエレンビニレン、青色染料材料にはポリフェニレンビニレン、黄色染料材料にはポリフェニレンビニレン、青色染料材料にはポリフェニレンビニレンおよびポリアルキルフェニレンを使用する。これらの有機エレクトロ材料は、液状プリンティング、ディスプレイ、テクノロジであり、液体が入手可能である。

【0016】最後に、厚さ0.1〜0.2ミクロンのMgAg反射電極109を蒸着法により形成する。

【0017】これにより、直視型のフルカラー有機EL表示体が完成する。

【0018】(実施例2) 図2に示すように、ガラス基板201上に薄膜トランジスタ202を形成してから、ALLI反射画素電極203を形成する。

【0019】次に、インクジェットプリント装置207により赤、緑、青色を発色する発光材料をパターンニング

黄色光材料にはシアノポリフェニレン、緑色光材料にはシアノポリフェニレン、青色光材料にはシアノポリフェニレン、白色光材料にはシアノポリフェニレンによる。これらの有機LED材料はケンブリッジ・ディスプレイ・テクノロジー社とロジック社製であり、液状で入手可能である。

【0020】正孔注入材料としてポリマ—前駆体であるポリポリテトラヒドロチオフェンフルフェニレンをキヤスタ法により形成する。加熱により、前駆体はポリフルフェニレンとなり、正孔注入層208が形成される。

【0021】最後に、ITO透明電極209を蒸着法により形成する。

【0022】これにより、反射型のフルカラー有機EL表示体が完成する。

【0023】(実施例3) 有機発光層の有機発光材料として、2,3,6-トリフェニロロ-1-オキソ-1H-イミダゾ[6,7-g]-キノリジンを10-カルボン酸をペンゾピラノ[6,7-g]-キノリジンを発光材料として、1-ビス-(4-N,N-ジアルキルアミノフェニル)シクロヘキサノールを用い、両者を混合することで緑色の発光材料とする。

【0024】同様に、赤色の有機発光材料として、2-(3',4'-ジヒドロキシアニル)-3,5,7-トリヒドロキシ-1-ベンゾピリウムパークロレートを用いて正孔注入層材料と混合する。

【0025】更に、青色発光層には有機正孔注入材料としてトリス(8-ヒドロキシキノリン)アルミニウムを用い、有機発光材料として、2,3,6,7-テトラヒドロ-9-メチル-11-オキソキノリン-11H-(1)ベンゾピラノ[6,7,8-*g*]キノリンを混合し、発光材料を作成する。

【0026】実施例1または実施例2と同様な工程で、
 各々の発光層をインクジェットプリンタ装置により局所
 パターニングし、アクティブマトリックス型有機EL装
 置を作成する。

【0027】なお、本実施例で使用した樹脂E1材料以外にも、アロマトリppingアミン誘導体 (TDP)、オキシジアンダーマイン (OXD)、オキシジアンゾール誘導体 (PBD)、ジチアルール誘導体 (DS)、アミノール誘体 (Beq)、トリフェニルアミン誘導体 (MTDA)、ジチアルドリン誘導体、ピラゾリン誘導体、ポリフェニレン、ポリアールフルベン、ポリアールフルベン、アノキチン亜鉛錯体、ポリフィリン亜鉛錯体、ピラゾール亜鉛錯体、フェナントロン錯体、ピラゾール錯体が使用できるが、これに限られるではない。

【0028】
【発明の効果】従来、パターンニングができなかった有機EL材料をインクジェット方式により形成および配列することでパターンニングが可能となり、フルカラー表示

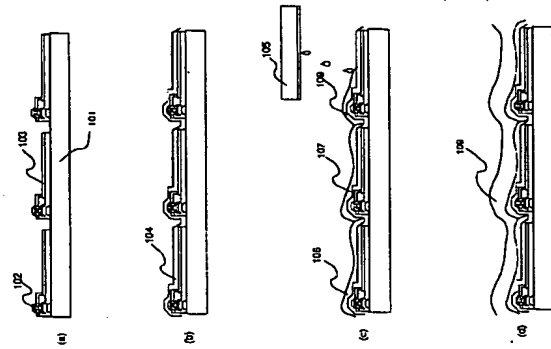
示のアクティブマトリックス型有機EL表示体を実現した。これにより、安価で大画面のフルカラー表示体が製造可能となり、効果は大である。

【図面の簡単な説明】
 【図1】本発明の第1の実施形態におけるアクティブマトリックス型有機EL表示装置の工程を示す図である。
 【図2】本発明の第1の実施形態におけるアクティブマトリックス型有機EL表示装置の工程を示す図である。
 【図3】本発明の第1の実施形態におけるインクジェット法により形成された異色層を示す図である。

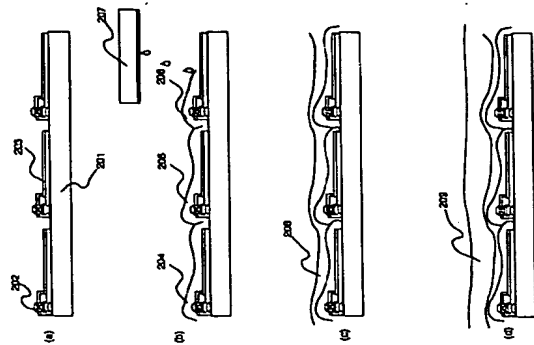
【符号の説明】

- | | | | |
|-----|--------------|-----|-------------|
| 101 | ガラス基板 | 301 | 倍号線 |
| 102 | 増幅トランジスタ | 302 | ゲート線 |
| 103 | 透明面電極 | 303 | 面電極 |
| 104 | 正柱注入層 | 304 | 増幅トランジスタ |
| 105 | インクジェットリタヘッド | 305 | 有機発光層 (第1色) |
| 106 | 有機発光層 (第1色) | 306 | 有機発光層 (第2色) |
| 107 | 有機発光層 (第3色) | 307 | 有機発光層 (第3色) |

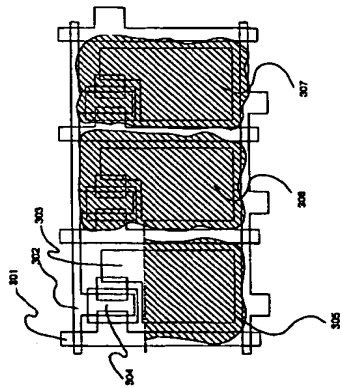
【圖】



[X2]



[図3]



(3)

の形状および配列が最終パターンとなるようインクジェット方式により形成することを特徴とする。また、両膜トランジスタを有するガラス基板に形成された透明導電層上層に少なくとも各面素極に赤、緑、青より選択された発光色を有する有機発光層が形成され、この上層に正孔注入層が形成され、更にこの上層に透明電極が形成されるアクティブマトリックス型有機EL表示体の製造方法において、前記有機発光層をその形状および配列が最終パターンとなるようインクジェット方式により形成することを特徴とし、また、両膜トランジスタを有するガラス基板に形成された反射面導電層上層に少なくとも各面素極に赤、緑、青より選択された発光色を有する有機発光層が形成され、更にこの上層に透明電極が形成されるアクティブマトリックス型有機EL表示体の製造方法において、前記有機発光層をその形状および配列が最終パターンとなるようインクジェット方式により形成することを特徴とする。

【手続補正3】

【補正対象書類名】明細書

【補正対象項目名】0010

【補正方法】変更

【補正内容】

[0010]更に、両膜トランジスタを有するガラス基